

Structural Biochemistry (BIBC 100)

Welcome to BIBC 100!

Biochemistry is – quite literally – the chemistry of life, and the knowledge you gain in this course will serve as the foundation for your future pursuits in science, whether that means going to medical school, pursuing a career in research, or other paths too numerous to count. This class covers a lot of material, but it will be worth it!

Course Information

Lecture time & location	Lecture: MWF 1:00-1:50 PM, Mandeville B-202 Remote discussion: F 11:00-11:50 AM, Zoom
Remote discussion time & location	Friday 11:00-11:50 AM Zoom: https://ucsd.zoom.us/j/98564015720?pwd=ZXBwQm9jODQycXgyVTFTYzVESVNSUT09 Meeting ID: 985 6401 5720 Password: BIBC100 <i>This is a recurring meeting link; it will be the same each week</i>
Instructor	Kevin Corbett kcorbett@ucsd.edu Office hours: Monday 4:00-5:30 PM, CMM East room 2044
TA	Torrey Rhyne trhyne@ucsd.edu Office hours: Tues/Thurs 12:30-1:30 PM at Art of Espresso
IAs	Alexander Bottome abottome@ucsd.edu Office hours: Monday 11:00 AM-12:00 PM, Zoom: TBD Sebastian Gastelum sgastelum@ucsd.edu Office hours: Wednesday 3-4 PM, Zoom: https://ucsd.zoom.us/j/93705316910 Meeting ID: 937 0531 6910 Karen Nguyen khn006@ucsd.edu Office hours: Thursday 2:30-3:30 PM, Zoom: https://ucsd.zoom.us/j/94819729958 Meeting ID: 948 1972 9958

Communicating

We want to communicate with you in ways that are effective and sustainable. I often make announcements on Canvas. Be sure you can receive them, please!

The Canvas discussion boards are your best resource for content-related questions. Especially if you post early in the week, you are quite likely to get several answers to your question. I read the discussion boards and respond to common questions in class.

Office hours are also a great time to ask *any questions*. We prioritize course content, but are happy to chat, too.

Email is for questions that can be answered in one or two sentences. We'll respond between the hours of 9 am and 5 pm on weekdays. The best way to email us is directly through Canvas. If you send an email outside Canvas, please include "BIBC 100" in the subject line. If we don't respond within 24 hours, email again, please!

If we receive a more involved question via email, we will ask you to attend office hours or to schedule a Zoom meeting. Those options are better for everyone, *promise*.

Course Learning Outcomes

Cross-cutting concepts in the course

These concepts will always be central to our conversations: (1) Chemical bonds, both covalent and non-covalent; (2) Energy of intra- and inter-molecular systems; (3) Three dimensional structures of macromolecules and their spatial interactions.

General Topics to be covered

1. **Molecular Interactions and Thermodynamics:** Entropy, Enthalpy, Gibbs free energy, and how macromolecules fold into stable structures in an aqueous (water-based) environment.
2. **Protein Structure and Folding:** Polypeptide structure at different levels, how proteins interact with other macromolecules and mediate chemical reactions and signaling.
3. **Nucleic Acid Structure:** DNA and RNA structure, DNA replication, information flow in a cell.
4. **Lipid and carbohydrate structures:** phospholipid structure, properties of lipid membranes, carbohydrates and glycoproteins.
5. **Macromolecular interactions and allostery:** How macromolecular interactions in a cell drive catalysis and signaling, and how these interactions are regulated by covalent and non-covalent interactions.

Course Format

Lecture & Discussion

Lectures will cover a lot of material but also integrate active learning elements to gauge understanding along the way. I expect students to actively in class, including consulting with peers, answering iClicker questions, and asking questions when things are not clear.

Attendance at lecture represents 10% of your grade (see attendance policy below).

There will be single remote discussion held on Zoom each week. These sessions will provide a valuable opportunity for students to review material and work with the TA and IAs to improve their understanding. Attendance in the discussion is highly recommended, but is not required.

Discussion Boards

Meaningful participation on the discussion boards is required each week and represents 10% of your grade. You should do one of the following:

- 1) List a learning objective and ask a meaningful question about it.
- 2) Restate a quiz or problem set question and ask a meaningful question about it.
- 3) Respond to a classmate's question in a meaningful way.
- 4) List a learning objective and meaningfully demonstrate how you think about or do that learning objective. Do your best to avoid repeating what I say.

Quizzes

Completion of weekly quizzes is required and represents 10% of your grade. Quizzes are opportunities to test your understanding of key topics without the pressure of an exam. Quizzes are graded, but students are given multiple attempts for each question. The goal here is learning, not necessarily getting a high score.

Problem Sets

Completion of weekly problem sets is required and represents 15% of your grade. These are opportunities to dig deeper into key topics than can be done with a quiz, and to synthesize concepts as we go through the course. Students are free to use any tools at their disposal to complete problem sets (yes, including AI tools). Whatever tools you use, make sure to check your facts and test your own understanding of the material. These activities are intended to help you learn.

Problem sets are graded for completion, not accuracy. Answer keys will be posted after each problem set's due date.

Midterm Exams

Two midterm exams will be held in class and represent 30% of your grade (2 x 15%). There will be a multiple choice section and a short answer section on each midterm.

Final Exam

The final exam represents 25% of your grade. There will be a multiple choice section and a short answer section on the final exam.

Course Materials and Tools

Textbook

Voet, Voet, and Pratt “**Fundamentals of Biochemistry: Life at the Molecular Level**” 5th edition, ISBN: 9781118918401

This textbook is not required, since all material on quizzes, problem sets, and exams will be covered in lecture materials and slides. **However, the textbook is highly recommended** as it contains extra information and context that will aid understanding and help learning.

Supplemental learning materials, including additional reading and recommended instructional videos, will be posted on Canvas.

Technology Requirements

iClickers will be used each class, and will be used for recording attendance. Please be sure to bring one. You can use an iClicker or the mobile app, but please choose one and use it every time. Starting Spring 2024, an iClicker Cloud account is required. Please register [here](#) or use the “iClicker Cloud Registration” link on Canvas. **Make sure to register using your UCSD email address**; otherwise, your account won’t properly link to Canvas.

If you are having problems with iClickers not connecting or the results not showing up in Canvas, please contact UCSD EdTech at servicedesk@ucsd.edu.

This class will be podcast. Podcasts will be available on the class Canvas page.

All quizzes and discussion boards are on Canvas.

Weekly problem sets and exams will be graded using Gradescope.

Assignments, Projects, and Grading

Summary of Grade Criteria

Assignment	Weight	Due Date
Lecture Attendance	10%	Each class
Weekly Discussion boards	10%	Mondays by noon (on Canvas)
Weekly Quizzes	10%	Fridays by noon (on Canvas)
Problem Sets	15%	Fridays 11:00 AM (upload to Canvas)
Midterm 1	15%	In class April 26
Midterm 2	15%	In class May 20
Final Exam	25%	June 13 11:30 AM to 2:30 PM (location TBD)

	100%	
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Grading Scale

Total points	Grade
97-100%	A+
93-97%	A
90-93%	A-
87-90%	B+
83-87%	B
80-83%	B-
77-80%	C+
73-77%	C
70-73%	C-
60-70%	D
0-60%	F

Grading Procedure and Feedback

First and foremost, students in this class will NOT—in any way—be competing with one another for grades. I have no quotas for As, Bs, or Cs. I reserve the right to adjust the above scale, but any changes will always be in your favor. I will NOT make grading more stringent.

Quizzes and Problem sets will be accepted up to one week late for half credit.

Each week's discussion board is closed the following Monday at noon; late posts are not accepted.

The midterms and final will be graded in a timely fashion. Grades will be posted on Canvas.

Exam Regrades

All requests for an exam regrade will be taken under hospitable consideration. I do regrades by meeting with students individually, either in person or by Zoom. Please email me and propose three one-hour blocks during which we can schedule a 15-minute meeting.

My aim is for regrade meetings to be friendly and productive for everyone, myself included. Tests are imperfect instruments. Learning and cooperativity are our priorities.

Please don't ask TAs/IAs for regrades. Doing so will be considered a breach of academic integrity.

Attendance and Participation

In-person lecture attendance accounts for 10% of your final grade. These are basically “free” points, but I hope they make my emphasis clear: Our classroom and your peers are the most valuable part of this course.

Remote section attendance is optional. If you attend and participate, you can expect to fully grasp the problem sets.

Life happens. So, **six absences from lecture will be excused without question.** Absences for religious belief, observance, or practice will be accommodated.

Instructional Team

This course has one faculty instructor, one graduate TA, and three undergraduate IAs. See the page “Meet the Instructional Team” on the course Canvas page for introductions!

Course Policies

Subject to Change Policy

The information contained in this course syllabus, other than the grade and absence policies, may be—under certain circumstances such as mutual agreement to enhance student learning—subject to change with reasonable advance notice.

Letter of Recommendation Policy

I am happy to write letters of recommendation for students’ applications to medical school, graduate school, or for other reasons. However, to write a good recommendation letter, I have to know you! If you expect to eventually need a letter of recommendation, please go the extra mile by participating actively in discussion boards, participating in class, and attending office hours when needed.

Technology Policy

Students are free to bring and use laptops and phones to class. Please be respectful of your neighbors and silence your devices, and be respectful of your instructors and remove your headphones while in class.

All exams will be held on paper, and students are not permitted to use digital devices during exams.

AI Policy

AI tools built using large language models like ChatGPT, Gemini, or Claude are increasingly useful tools to aid writing, look up information, etc. However, due to their architecture, these tools can provide answers that sound good but are factually incorrect. If you use an AI tool to generate or check/edit discussion board posts, you are required to note in the post that it was generated with the help of AI.

Campus Policies

- Please read UC San Diego’s [Policy on Integrity of Scholarship](#) and take the [integrity pledge](#)!
- [UC San Diego Principles of Community](#)
- [UC San Diego Policy on Integrity of Scholarship](#)
- [Religious Accommodation](#)
- [Nondiscrimination and Harassment](#)
- [UC San Diego Student Conduct Code](#)

Course Schedule

This course moves fast and covers a lot of material. Following each week's lectures (1 PM Monday, Wednesday, and Friday), we will post an online Canvas quiz (due the following Monday by noon) and a problem set (due the following Friday by 11:00 AM). Students are required to participate in the Discussion Boards each week, either asking or answering a question (due each Monday at noon).

Discussion sections (11 AM Fridays on Zoom) will be devoted to working through problem sets (which are due immediately prior to discussion), and reviewing material before exams.

The class is broken up roughly into thirds: **The first segment (lectures 1-10)** covers thermodynamics and energetics of macromolecules, followed by protein structure; **the second segment (lectures 11-19)** covers nucleic acids, carbohydrates, and lipids; **and the third segment (lectured 20-26)** covers enzymatic catalysis, signaling, and (hopefully!) two topics that will push students to integrate concepts running throughout the course.

After each segment of the course, there will be one class period devoted to an overview of that segment, focusing on concepts that students highlight in discussion boards, in section, and at office hours. The two midterm exams will be given in class (50 minutes), and the final will be given in person (3 hours). **All exams are cumulative.**

A detailed schedule for the class, including recommended textbook reading and due dates for all assignments, is shown on the next page.

	Date	Lecture	Topic	Texbook reading	Assignment
Monday	4/1/24	0	Introduction to course	Chapter 1, sections 1-2	
Wednesday	4/3/24	1	Thermodynamics	Chapter 1, section 3	
Friday	4/5/24	2	Water	Chapter 2, sections 1-2	
Monday	4/8/24	3	Proteins I: Amino acids & Protein primary structure	Chapter 4, sections 1-3	Week 1 discussion board due
Wednesday	4/10/24	4	Proteins II: Protein 3D structure	Chapter 6, sections 1-3	
Friday	4/12/24	5	Proteins III: Protein folding and chaperones	Chapter 6, sections 4-5	Week 1 quiz due; Week 1 problem set due
Monday	4/15/24	6	Proteins IV: Allostery (myoglobin and hemoglobin)	Chapter 7, section 1	Week 2 discussion board due
Wednesday	4/17/24	7	Proteins V: Scaffold and motor proteins (actin and myosin)	Chapter 7, section 2	
Friday	4/19/24	8	Proteins VI: Antibodies and protein-protein recognition	Chapter 7, section 3	Week 2 quiz due; Week 2 problem set due
Monday	4/22/24	9	Proteins VII: Protein evolution and structure predictions	Chapter 5, section 4	Week 3 discussion board due
Wednesday	4/24/24	10	Section I Overview		
Friday	4/26/24		Exam 1 - Lectures 1-10		Week 3 quiz due; Week 3 problem set due
Monday	4/29/24	11	Nucleic Acids I: nucleotides and nucleic acid polymers	Chapter 3, section 1-2	Week 4 discussion board due
Wednesday	5/1/24	12	Nucleic Acids II: The central dogma and DNA replication	Chapter 3, section 3	
Friday	5/3/24	13	Nucleic Acids IV: Sequencing and manipulating DNA	Chapter 3, sections 4-5	
Monday	5/6/24	14	Carbohydrates I: Mono- and polysaccharides	Chapter 8, sections 1-2	Week 5 discussion board due
Wednesday	5/8/24	15	Carbohydrates II: Glycoproteins	Chapter 8, section 3	
Friday	5/10/24	16	Lipids I: Lipids and Lipid bilayers	Chapter 9, sections 1-2	Week 5 quiz due; Week 5 problem set due
Monday	5/13/24	17	Lipids II: Membrane Proteins	Chapter 9, sections 3-4	Week 6 discussion board due
Wednesday	5/15/24	18	Lipids III: Membrane Transport	Chapter 10, sections 1-3	
Friday	5/17/24	19	Section II Overview		Week 6 quiz due; Week 6 problem set due
Monday	5/20/24		Exam 2 - Lectures 11-19		Week 7 discussion board due
Wednesday	5/22/24	20	Enzymes I: Reactions and catalysis	Chapter 11, sections 1-3	
Friday	5/24/24	21	Enzymes II: Serine protease mechanism	Chapter 11, section 5	
Monday	5/27/24		<i>No class - Memorial Day</i>		Tuesday 5/28: Week 8 discussion board due
Wednesday	5/29/24	22	Signaling I: Kinases and phosphatases	Chapter 13, section 2	
Friday	5/31/24	23	Signaling II: Phosphoinositide signaling	Chapter 13, section 4	Week 8 quiz due; Week 8 problem set due
Monday	6/3/24	24	CRISPR-Cas as a genome engineering tool	Supplemental reading	Week 9 discussion board due
Wednesday	6/5/24	25	SARS-CoV-2 mRNA vaccines	Supplemental reading	
Friday	6/7/24	26	Section III Overview		Week 9 quiz due; Week 9 problem set due
Monday	6/10/24				Week 10 discussion board due

Resources for Support and Learning

There are a variety of resources available to students at UC San Diego, which are designed to address needs and enhance the student experience. In this section, the course is connected to the broader university community by services and programs for students. If there are resources specific to the course, school, department and/or topic, be sure to include those here.

<p>Learning and Academic Support</p>	
<p>Ask a Librarian: Library Support <i>Chat or make an appointment with a librarian to focus on your research needs</i></p> <p>Course Reserves, Connecting from Off-Campus and Research Support <i>Find supplemental course materials</i></p> <p>First Gen Student Success Coaching Program <i>Peer mentor program that provides students with information, resources, and support in meeting their goals</i></p> <p>Office of Academic Support & Instructional Services (OASIS) <i>Intellectual and personal development support</i></p>	<p>Writing Hub Services in the Teaching + Learning Commons <i>One-on-one online writing tutoring and workshops on key writing topics</i></p> <p>Supplemental Instruction <i>Peer-assisted study sessions through the Academic Achievement Hub to improve success in historically challenging courses</i></p> <p>Tutoring – Content <i>Drop-in and online tutoring through the Academic Achievement Hub</i></p> <p>Tutoring – Learning Strategies <i>Address learning challenges with a metacognitive approach</i></p>
<p>Support for Well-being and Inclusion</p>	
<p>Basic Needs at UCSD <i>Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live is encouraged to contact: foodpantry@ucsd.edu basicneeds@ucsd.edu (858) 246-2632</i></p> <p>Counseling and Psychological Services <i>Confidential counseling and consultations for psychiatric service and mental health programming</i></p> <p>Triton Concern Line <i>Report students of concern: (858) 246-1111</i></p> <p>Office for Students with Disabilities (OSD) <i>Supports students with disabilities and accessibility across campus</i></p>	<p>Community and Resource Centers Office of Equity, Diversity, and Inclusion <i>As part of the Office of Equity, Diversity, and Inclusion the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus (858).822-.3542 diversity@ucsd.edu</i></p> <p>Get Involved <i>Student organizations, clubs, service opportunities, and many other ways to connect with others on campus</i></p> <p>Undocumented Student Services <i>Programs and services are designed to help students overcome obstacles that arise from their immigration status and support them through personal and academic excellence</i></p>

Thanks very much to Dr. Matt Flagg, Dr. Sonya Neal, and the UCSD Teaching and Learning Commons for help assembling this syllabus!